CROP BIOTECH UPDATE

A weekly summary of world developments in agri-biotech for developing countries, produced by the Global Knowledge Center on Crop Biotechnology, International Service for the Acquisition of Agri-biotech Applications SEAsiaCenter (ISAAA)

July 15, 2005

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NEWS

AFRICA URGED TO SPEED UP COMMERCIALIZATION OF BIOTECH CROPS

African countries have been urged to speed up the process of putting genetically improved crops into the hands of farmers.

“Africa must decide now whether their public biotech crop research will remain purely just that: research,” said Dr Joel I. Cohen, Director, Program for Biosafety Systems (PBS), at a press conference in Nairobi, Kenya, where he launched the findings of a new biotech crop survey conducted in Egypt, Kenya, South Africa, and Zimbabwe. Dr Cohen, who is also a Senior Research Fellow with the International Food Policy Research Institute (IFPRI), said lack of biosafety laws in most African countries was to blame for non-commercialization of transgenic crops; yet such crops had the potential to reduce the use of pesticides, increase drought tolerance, and improve the nutritional value of staple foods on the continent.

The new study, commissioned by IFPRI and conducted by Dr Cohen and Prof Idah Sithole-Niang of the University of Zimbabwe, assessed the state of public biotech crop research, the types of genes being used, and the biosafety and regulatory challenges facing Africa. According to the study, current biotech research has the potential to benefit the environment, improve health, reduce the cost of food, and increase the incomes of poor smallholder farmers throughout Africa. The study documents public biotech research on 20 different crops, including maize, sweet potato and cowpeas. It focuses on improving resistance to diseases and pests that increasingly devastate crop yields on the continent. The study recommends an increase in small-scale, confined field trials to test crops, determine safety, and receive feedback from farmers. It also stresses the need to provide decision-makers with science-based biosafety information, so as to improve the clarity of regulatory policies and procedures.

For details contact Daniel Otunge of KBIC on dotunge@absfafrica.org

CGIAR FORGES STRONGER INITIATIVE

The Consultative Group on International Agricultural Research (CGIAR) has brought its 15 international agricultural research institutes together into a formal, stronger Alliance of Future Harvest Centers. This Alliance was created to bring resources and programs together, and to make this partnership work in areas where the CGIAR’s help is needed most in addressing critical problems.

The CGIAR will also streamline access to its Future Harvest Centers, bring more disciplines and lines of thought to enhance institutional innovations, enable Centers to speak with one voice on global issues, achieve cost savings in corporate services, and resolve conflicts. All these are meant to increase the efficiency, effectiveness, and synergy amongst the Centers, and likewise increase the overall performance of the CGIAR system.

The Alliance may also have its own office soon, within the premises of the International Fund for Agricultural Development (IFAD) at Rome, Italy. Discussions are already underway.

For more information, as well as the press release, visit http://www.icrisat.org.

ARS TO HELP IMPROVE CASSAVA

The Agricultural Research Service (ARS), the United States Department of Agriculture's (USDA) chief scientific research agency, will soon contribute to the improvement of cassava, one of the African continent's most important food crops. With ARS molecular biologist Edgar B. Cahoon, the project aims to increase the cassava root's vitamin A and E content.

Cassava is a major food source for most Africans, and is the fourth most important crop in the world. Its root is low in protein and several micronutrients, however, so the new project seeks to develop modified roots with higher levels of zinc, iron, protein, and vitamins A and E. It also hopes to produce cassava with longer shelf life and resistance to geminivirus infection. Development of the product will take place in the United States, and will be tested for nutrient content and field stability and safety in Africa.

The project, called "BioCassava Plus," is a 10-institution wide endeavor, and is one of the Bill and Melinda Gates Foundation's program grants in its "Grand Challenges in Global Health" initiative. For more information, visit http://www.ars.usda.gov/is/pr/2005/050711.htm.

EUROPE'S STRATEGIC RESEARCH AGENDA OUT

The strategic research agenda 'Plants for the future' on how Europe can improve the safe exploitation of the genetic diversity in plants using plant genomics and biotechnology has just been released. It was an output of a multi-sectoral group that included research institutions, industry, farmers, regulatory authorities, as well as consumer and environmental organizations.

Europabio, the European association of bioindustries, said that the agenda defines the strategic research priorities for the two coming decades. The priorities are to produce healthy and safe food and feed, and to increase competitiveness of the agricultural value chain while contributing to sustainability.

Specifically, the research platform will focus on aspects in agriculture, raw materials, feed and food, such as oil plants containing more long-chain polyunsaturated fatty acids with health benefits for humans, or crops with higher levels of vitamins. It will also deal with animal feed crops that are important to Europe such as wheat, grain, legumes, and rapeseed. Crop research will also be done to reduce the need for agricultural inputs and better disease protection.

Download the 100-page agenda by visiting http://www.europabio.org.

CHINA APPROVES NEW GM CORN VARIETY

Mike Johanns, Secretary of the US Department of Agriculture, announced that China has approved NK603, a variety of Round Up Ready corn, bringing the total Chinese biotech approvals to eight varieties of corn, two of cotton, seven of canola and one variety of soybeans. Johanns also said that the US will work with China to promote a regulatory system based on sound science to expedite future approvals.

Secretary Johanns and Minister Li Changjiang of China's General Administration of Quality Supervision, Inspection and Quarantine agreed on a memorandum of understanding (MOU) to improve bilateral cooperation on animal and plant health and food safety. This will enable the US to address the sanitary, phytosanitary, and food safety issues that have hindered its agricultural access to China. The MOU also provides for the exchanges of information on relevant laws; regulations and standards; inspection and quarantine procedures; methodology and technology; pests and disease; toxic and harmful residues; food certification and establishment registration.

For more of Johanns' first visit to China, visit http://www.usda.gov.

FAO REPORTS ON WORLDWIDE GM TREE EFFORTS

A new global study of biotechnology in forestry conducted by the Food and Agriculture Organization (FAO) revealed that about 70 percent of forest biotechnology activities is taking place in developing countries. India and China are the most active players in the developing world.

Of the over 2700 biotechnology activities reported worldwide over the past 10 years, genetic modification accounts for around 19 percent only. FAO reported that overall, genetic modification activities in forestry are taking place in at least 35 countries, with the vast majority at the laboratory stage, with some supporting field trials.

The study also noted that more than 210 field trials of genetically modified (GM) trees are currently under way in 16 countries. Most of the trials which are largely on *Populus, Pinus*, *Liquidambar* and *Eucalyptus*, are being conducted in the US. Only China has reported the commercial release of GM trees: around 1.4 million plants on 300-500 hectares in 2002.

Read more on the FAO study at http://www.fao.org.

Research

TOMATO GETS NUTRIENT BOOST

In the latest issue of *Nature Biotechnology*, Ganga Rao Davuluri of Stazione Zoologica, Naples, Italy, and colleagues demonstrate that "Fruit-specific RNAi-mediated suppression of *DET1* enhances carotenoid and flavonoid content in tomatoes." The research shows new work on raising the levels of nutritious compounds in tomato through the use of inverted repeat RNA interference (RNAi) constructs under the control of fruit-specific promoters – and through the control of a single gene.

The gene in question is DET1, which codes for a transcription factor first identified in *Arabidopsis*. DET1 mutants can grow in the dark, as though the plants were exposed to light. Researchers were able to engineer tomato plants in such a way that DET1 would be suppressed by RNA interference, but would not result in any other disruption of plant metabolism or growth.

After testing the fruits for nutrient content, researchers found that both lycopene and beta carotene were present at higher levels than in wild-type fruits. Other nutrients were also increased, including chlorgenic acid and naringenin-chalcone. All the increased nutrients have been shown to be potent antioxidants in previous studies.

The findings of the research may prove to be highly beneficial to both consumers and the food industry. First, the transgene and the constructs created are of host plant origin, the gene in question has natural mutants, and the modifications on the plant do not result in lower yield.

Download the journal article at http://www.nature.com/nbt/journal/v23/n7/pdf/nbt1108.pdf, and the news at http://www.nature.com/nbt/journal/v23/n7/pdf/nbt0705-825.pdf

PAPER ASSESSES BIOTECH IN AFRICA

Carl K. Eicher and colleagues of the Department of Agricultural Economics. Michigan State University write on “Biotechnology And The African Farmer,” a staff paper produced and published online by the university. It seeks to answer why most African governments underinvest in modern and productive agriculture, and why countries in Africa are fearful of supporting and investing in the gene revolution.

The paper is divided into five parts. The first discusses the problem; the second and third present the case studies on the use of genetically modified (GM) crops in Africa; the fourth draws lessons from the case studies; and the fifth discusses what financial resources, infrastructure, and expertise (scientific, technical, political, institutional, and financial) are needed to help Africa overcome these barriers and join the global biotech revolution.

The researchers conclude that agricultural biotechnology has the potential to help African smallholders, and also confer benefits to consumers, the environment, and health of farmers and farm worker. In particular, it concludes that investment in major agricultural biotechnology institutions should be given immediate and sustained priority; African capacity in biosafety, regulatory procedures, and research, among others, should be strengthened; and African governments should invest in long term training programs for African scientists to allow them to become efficient borrowers of GM research while building their own capacity to carry out the same research in Africa.

For more details, read the paper at http://agecon.lib.umn.edu/cgi-bin/pdf_view.pl?paperid=16821&ftype=.pdf

VITAMIN C ALSO HELPS PLANTS, RESEARCH SHOWS

In “Increasing Tolerance to Ozone by Elevating Foliar Ascorbic Acid Confers Greater Protection Against Ozone Than Increasing Avoidance,” Daniel Gallie and Zhong Chen of the University of California, Riverside show that Vitamin C can help plants defend themselves against the destructive effects of ozone. Their findings are published in the latest issue of Plant Physiology.

Atmospheric oxygen, though beneficial for most living organisms, can be degraded to ozone. Exposure to ozone, in the case of plants, results in impaired photosynthesis, reduced growth, and an accelerated onset of senescence in plants. In the research, the authors increased the vitamin level in leaves by manipulating dehydroascorbate reductase (DHAR), a naturally occurring enzyme that recycles vitamin C. Using transgenic tobacco exposed to varying levels of ozone, the researchers showed that the change also reduced the harmful effects

of ozone on plants, such as brown spots, slower plant growth, and lowered crop yields. Moreover, after enzyme assays and measurement of stomatal size in transgenic plants, among other protocols for measuring the effects of ozone on plant growth and metabolism, they found that DHAR-overexpression allowed plants to have higher levels of chlorophyll, and a higher level of photosynthetic activity.

Read more at http://www.plantphysiol.org/cgi/content/full/138/3/1673

RESEARCH LOOKS INTO COLD, SALT INTOLERANT PLANT

Jianhua Zhu of Purdue University, USA found out that “HOS10 encodes an R2R3-type MYB transcription factor essential for cold acclimation in plants.” The research reports the identification and characterization of an Arabidopsis mutant extremely sensitive to freezing temperatures and sodium chloride levels due to the mutation of a gene, and is published in the latest issue of the Proceedings of the National Academy of Sciences online.

Plant metabolism is highly complex, and still not completely understood. For instance, evidence indicates that metabolic pathways can cross each other and affect one another when pathways controlling drought, salinity, and cold tolerance are concerned. Through RNA gel analysis, cloning of the HOS10 gene, mutation of the gene, and identification of the HOS10 locus, among other things, researchers produced plants which were reduced in size, flowered early, and yet had reduced fertility. These HOS10 mutants, moreover, could not survive in cold and high salt conditions, and could not synthesize an important hormone.

This mutation, researchers said, could prove useful in further studies involving connections between cold or salt tolerance, and plant metabolism. Download the complete article at http://www.pnas.org/cgi/reprint/102/28/9966.

DOCUMENT REMINDERS

PEW INITIATIVE POSTS PROCEEDINGS

Conference Proceedings on Genetically Modified Insects Posted by Pew Initiative

In September 2004, the Pew Initiative on Food and Biotechnology hosted an international conference to explore the scientific and public policy issues surrounding the potential release of genetically modified insects. Proceedings from the conference, titled “Biotech Bugs: A Look at the Science and Public

Policy Surrounding the Release of Genetically Modified Insects" are now available in English, French, and Spanish translations on the Pew Initiative website.

Proceedings and highlights from the conference can be viewed and downloaded at: http://pewagbiotech.org/events/0920/.

IFDC RELEASES NEWSLETTER

The International Fertilizer Development Center (IFDC) has released the latest edition of its newsletter. Readers can access articles on a new project, "Strengthening Networks of Regional Market Information Systems and Traders' Organizations in West Africa," (MISTOWA) which promises to increase agricultural trade in West Africa; an action plan prepared for Tanzania; and a strategy developed for the supply and use of fertilizer in Angola, among other headlines.

Download the newsletter at
http://www.ifdc.org/PDF_Files/June2005EnglishNewsletter.pdf.

CBTNEWS FEATURE

Clay, Iron, Grain

Agriculture in the Jomon, Yayoi, and Satsumon Cultures of Ancient Japan

Through the eyes of a poet, Japan is a land of traditions and mystery, rice fields and cherry blossoms, and ancient tales of warriors and feudal lords riding through strange, fog-clouded lands. The country, however, is more than the stuff of legends, myths, and the occasional Samurai warrior. It can trace its roots back to 30,000 B.C., when the first civilizations took root and broke the patterns of civilizations elsewhere in the world.

The Jomon were the first to settle in the Japanese isles. A hunting, gathering, and fishing society, the Jomon flourished in 10,000 B.C., and eventually became known for their pottery. Their work represents the very first ceramics in human history, predating Mesopotamian ceramics by over two thousand years.

Patterns in other civilizations indicate that pottery-making should develop after agriculture, since the produce surplus would spawn a need for a means of storage. The Jomon, however, remained nomadic for most of its existence, and

its society was characterized by small tribal groups. They had developed the art of pottery long before agriculture was introduced to Japan – long before any agriculture of any sort was introduced to the world. This pottery has so been associated with the name Jomon; the term, in fact, means “cord pattern,” and is derived from the cord patterns the Jomon used to decorate their pottery.

World temperatures rose in the years 5000-2500 B.C., and it was during this time that the nomadic peoples of old developed agriculture. It was also during this time that the Jomon, living in the isles of Japan and cut off from most of the world, began to settle in large villages consisting of pit-houses, or dwellings whose floors sink to about a foot below ground level. A simple, proto-agriculture likewise developed for the Jomon, who had hitherto hunted, fished, and gathered nuts and roots. Evidence from excavated Jomon stone axes and simple implements show that the Jomon may have cultivated starchy yams and taro. They may have also used these rootcrops as sources of starch for their bread.

The Jomon thrived for the next few centuries, until tribes from mainland China began migrating out of their rapidly drying land. Northern China was once a temperate, fertile place, filled with forests, streams, and rainfall – until it began to dry up, producing what is now the Gobi desert. The original occupants also eventually moved out, to the South and East. Some tribes migrated to Korea, displacing indigenous populations. In a few more years, another wave of immigrants from China forced these erstwhile settlers to cross to Japan. These immigrants became known as the Yayoi.

The Yayoi were a rather primitive group, with no system of writing or monetary exchange, clothes woven from hemp or bark, and pottery slightly better – though more practical and less decorative – than the Jomon kind. They also brought metalworking to Japan, during a time when most implements were of stone or clay.

The most important contribution of the Yayoi to what would soon be Japanese culture was the irrigated cultivation of rice. Rice cultivation in particular – and agriculture, in general – changed the early Japanese lifestyle altogether. Nomadic peoples settled down into sedentary villages, and the usual slash and burn agriculture changed to one that was capable of supporting permanent villages, full or partial division of labor, and larger population density. Social classes also started to evolve, and parts of the country were soon united under powerful landowners.

The Yayoi civilization can be credited with bringing agriculture to the fore in ancient Japan. They were also able to develop advanced irrigation structures, and excavations in modern Japan show the outlines of rice paddy fields; irrigation channels equipped with dams and underdrains; and raised-floor housing structures apparently meant to keep grains out of the reach of rodents. While the

Yayoi plowed, sowed, and harvested irrigated rice fields, they were also able to grow other crops, including barley, wheat, and millet.

On the island of Hokkaido, in the meantime, and in part of Honshu, lived the Satsumon. The ancient civilization was also devoted to agriculture, and by the years 400-500 A.D. were well versed in the cultivation of bread wheat, millet, red bean, hemp, rice, melon, and safflower. On Hokkaido, in particular, buckwheat, barnyard millet, and sorghum were already being grown.

What is today's mix of sprawling, urbanized city centers and simple, temple-shadowed traditional dwellings is simply a land built on both myth and legend, and a legacy of life unlike any other during the dawn of modern man. Popularized by Hollywood as a world of warriors and emperors, and painted by literature as a country steeped and rich in heritage, today's Japan owes most of its traditions to the very first civilizations that stepped upon its rich, fertile soil.

ANNOUNCEMENT

FORMER MIT PRESIDENT TO DELIVER LECTURE

Dr. Charles Vest, former president of the Massachusetts Institute of Technology (MIT), will introduce new observations on the openness of research and partnership among universities and industry in "To Contribute to Society: Lessons learnt from building the relationship between University, Industry and Government in the USA". His lecture is supported by the University of Cambridge Vice-Chancellor's Office, and will be webcast live on July 15th, 2005, at 5 p.m., British Summer Time.

For more details, visit http://www.cambridge-mit.org/cgi-bin/default.pl?SID=6&NewsID=286

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